PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Evaluate Status Of Coastal Cutthroat Trout Above Bonneville Dam

BPA project number: 20026
Contract renewal date (mm/yyyy): ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Oregon Department of Fish and Wildlife

Business acronym (if appropriate) ODFW

Proposal contact person or principal investigator:

Name	David Ward/Mark Zimmerman
Mailing Address	17330 S.E. Evelyn Street
City, ST Zip	Clackamas, OR 97015
Phone	503 657-2000 x402
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NPPC Program Measure Number(s) which this project addresses
2.2A, 7.1C, 7.5E,

FWS/NMFS Biological Opinion Number(s) which this project addresses
N/A

Other planning document references
Multi-Year Implementation Plan;
Return to the River

Short description
Survey Columbia River tributaries above Bonneville Dam to determine status of coastal cutthroat trout and to identify limiting factors and anthropogenic impacts.

Target species
Coastal cutthroat trout

Section 2. Sorting and evaluation

Subbasin
Hood River/Fifteen Mile; Wind; Big White Salmon; Little White Salmon; Klickitat

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more	If your project fits either of these	Mark one or more categories

caucus	processes, mark one or both	
☒ Anadromous fish ☐ Resident fish ☐ Wildlife	☒ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☐ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description
20513	Hood River / Fifteen Mile Umbrella Proposal
9087	Acquire 1860 Fifteenmile Creek Irrigation Water Right
9146	Evaluate Effects of Habitat Work Conducted in Fifteen Mile Creek
9304000	Fifteen Mile Creek Habitat Restoration Project
9126	Hood River Fish Habitat Project
8805303	Hood River Production Program
8805304	Monitor Actions Implemented Under the Hood River Production Program
8902900	Hood River Production Program-Pelton Ladder-Hatchery
9301900	Hood River Production Program-Oak Springs, Powerdale, Parkdale O&M
9500700	Hood River Production Program-PGE: O&M

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9506800	Klickitat Passage/Habitat Improvement M&E	Coordination of work in Klickitat subbasin
9705600	Lower Klickitat River Riparian & In-Channel Habitat Enhancement	Coordination of work in Klickitat subbasin
9033	Document Native Trout Populations	Coordination of work in Wind, Little White Salmon, and Klickitat subbasins
9095	Bull Trout Population Assessment in the Columbia River Gorge, WA.	Coordination of work in Wind, Little White Salmon, and Klickitat subbasins

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
	N/A	

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Document existing data on historical and	a	Survey and review existing biological data,

	current distribution and describe management practices that affect coastal cutthroat trout in the Columbia River basin above Bonneville Dam.		subbasin plans, land management regulations, and current production and harvest management practices.
2	Determine status of naturally reproducing populations of coastal cutthroat trout above Bonneville Dam.	a	Survey streams above Bonneville Dam to determine presence-absence and relative abundance to determine life history aspects of cutthroat trout.
		b	Conduct intensive surveys at index sites to estimate density and biomass of cutthroat trout, and identify limiting factors associated with habitat and species interactions.
		c	Analyze scale, otolith, and tissue samples to describe age and growth, life history patterns, and genetic characteristics of cutthroat trout populations.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999	9/2000	Document and synthesize existing data on cutthroat status and management practices.		15.00%
2	10/1999	9/2002	Determine status of cutthroat trout populations.		85.00%
				Total	100.00%

Schedule constraints
If the project is funded, no schedule constraints are expected.

Completion date
FY 2002

Section 5. Budget

FY99 project budget (BPA obligated): $0

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	ODFW = $50,750 USGS = $46,500 WDFW = $6,740	%41	103,990
Fringe benefits	ODFW = $20,808 USGS = $13,950 WDFW = $2,157	%14	36,915
Supplies, materials, non-	ODFW = $18,000	%13	33,000

expendable property	USGS = $15,000 WDFW = $0		
Operations & maintenance	ODFW = $1,500 USGS = $1,400 WDFW = $0	%1	2,900
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%0	
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags:	%0	
Travel	ODFW =$6,000 USGS = $4,500 WDFW = $500	%4	11,000
Indirect costs	ODFW = $34,456 USGS = $30,913 WDFW = $1,879	%26	67,248
Subcontractor		%0	
Other		%0	
		TOTAL BPA FY2000 BUDGET REQUEST	$255,053

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
ODFW	Personnel, vehicles, sampling equipment	%3	9,000
USGS	Personnel, vehicles, sampling equipment	%2	6,500
WDFW		%0	
		%0	
		Total project cost (including BPA portion)	$270,553

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$300,000	$300,000		

Section 6. References

Watershed?	Reference
☐	Bohlin, T. 1982. The validity of the removal method for small populations -- consequences for electrofishing practice. Institute of Freshwater Research Drottningholm Report 60:15-18.
☐	Columbia Basin Fish and Wildlife Authority. 1997. Multi-year implementation plan for the protection, restoration, and enhancement of Columbia River Basin fish and wildlife resources. Presented to the Northwest Power Planning Council, Portland, OR.
☐	Connolly, P.J. 1996. Resident cutthroat trout in the central Coast Range of Oregon: logging effects, habitat associations, and sampling protocols. Doctoral dissertation. Oregon State University, Corvallis.

☐	Dolloff, C.A., D.G. Hankin, and G.H. Reeves. 1993. Basinwide estimates of habitat and fish populations in streams. General Technical Report SE-83. Asheville, North Carolina: U.S. Forest Service, Southeastern Forest Experiment Station.
☐	Hall, J.D., P.A. Bisson, and R.E. Gresswell. 1997. Sea-run cutthroat trout: biology, management, and future conservation. Oregon Chapter, American Fisheries Society, Corvallis.
☐	Hankin, D.G., and G.H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of Fisheries and Aquatic Sciences 45:834-844.
☐	Hess, S.S. 1982. Cutthroat trout in lower Columbia River tributaries of Oregon. Information Report Number 83-2, Oregon Department of Fish and Wildlife, Portland, Oregon.
☐	Hooten, B. 1997. Status of coastal cutthroat trout in Oregon. Information Report 97-2. Fish Division, Oregon Department of Fish and Wildlife, Portland, Oregon.
☐	Independent Scientific Group. 1996. Return to the River: Restoration of Salmonid Fishes in the Columbia River Ecosystem.
☐	Leider, S.A. 1997. Status of sea-run cutthroat trout in Washington. Pages 68-76 in J.D. Hall, P.A. Bisson, and R.E. Gresswell, editors. Sea-run cutthroat trout: biology, management, and future conservation. Oregon Chapter, Am Fish. Soc., Corvallis.
☐	Marshall, D.B., M.W. Chilcote, and H. Weeks. 1996. Species at risk: sensitive, threatened and endangered vertebrates of Oregon. Second Edition. Oregon Department of Fish and Wildlife, Portland, Oregon.
☐	Melcher, C.E. In press. The 1996 lower Columbia River and buoy 10 recreational fisheries. Columbia River Management, Oregon Department of Fish and Wildlife, Portland, Oregon.
☐	Nehlsen, W., J.E. Williams, and J.A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries 16(2):4-21.
☐	Olsen, J.B., J.K. Wenburg, and P. Bentzen. 1996. Semiautomated multilocus genotyping of Pacific salmon (Oncorhynchus spp.) using microsatellites. Mol. Mar. Bio. Biotech. 5(3):259-272.
☐	Trotter, P.C. 1989. Coastal cutthroat trout: a life history compendium. Transactions of the American Fisheries Society 118:463-473.
☐	Wenburg, J.K., J.B. Olsen, and P. Bentzen. 1996. Multiplexed systems of microsatellites for genetic analysis in coastal cutthroat trout (Oncorhynchus clarki clarki) and steelhead (Oncorhynchus mykiss). Mol. Mar. Bio. Biotech. 5(3):273-283.
☐	Zippin, C. 1956. An evaluation of the removal method of estimating animal populations. Biometrics 12:163-189.

PART II - NARRATIVE

Section 7. Abstract

Region-wide concern for declining stocks of Columbia River coastal cutthroat trout is documented in section 7.5E of the 1994 Columbia Basin Fish and Wildlife Program. The goal of the proposed study is to provide vital information on the current status of cutthroat trout populations in the lower Columbia Basin as a necessary prerequisite to future recovery efforts. Study objectives are to (1) document existing data on historical and current distribution and describe management practices that affect cutthroat trout in the Columbia River basin above Bonneville Dam, and (2) determine status of naturally reproducing populations of cutthroat trout above Bonneville Dam. Objective 1 will be conducted from 2000-01 using a combination of questionnaires and a review of existing biological data and land-use, production, and harvest management practices. Objective 2 will be conducted from 2000-02 by conducting fish and habitat surveys. Surveys will be used to estimate density and biomass of cutthroat trout at selected index sites. Analysis of length, weight, scales, otoliths, and selected tissue samples will be used to describe population characteristics including age and growth, life history patterns, and genetic characteristics of cutthroat trout.

Section 8. Project description

a. Technical and/or scientific background

Coastal cutthroat trout (*Oncorhynchus clarki clarki*) historically occurred in all lower Columbia River tributaries east to Hood River in Oregon and the Klickitat River in Washington (Hall et al. 1997). Sea-run populations of cutthroat trout supported robust recreational fisheries in the lower Columbia River as recently as 1985; however, sport angler catch and effort has since dramatically declined (Melcher in press). Some populations may be extinct and many are considered depressed (Hooten 1997; Leider 1997). The status of populations in Oregon were recently classified as "sensitive" (Marshall et al. 1996), and the Northwest Power Planning Council (NPPC) has identified sea-run cutthroat trout as a species of concern in its Columbia Basin Fish and Wildlife Program. Coastal cutthroat trout were petitioned for listing under the Endangered Species Act in 1997. Throughout their range, sea-run cutthroat trout have declined dramatically in the past 20 years (Trotter 1989), and their status may be more critical than other anadromous salmonids of the Pacific Northwest (Nehlsen et al. 1991). We have even less information on the status of non-anadromous forms of this species.

Poor hatchery returns and angling success are indications that populations of sea-run cutthroat trout are declining at an alarming rate throughout the lower Columbia River Basin. Annual main-stem harvest averaged nearly 5,000 fish from 1969 to 1985; but average harvest declined to 700 fish from 1986-1990. From 1991-1995, sport anglers harvested an average of only 175 fish per year, and harvest in 1996 dropped to a record low of six fish (Melcher in press). However, relating annual harvests to cutthroat trout abundance is confounded by increasingly restrictive angling regulations.

Annual escapement of adult cutthroat trout past Powerdale Dam on the Hood River ranged from 40-180 fish from 1963-71 (Hooten 1997). After monitoring at Powerdale Dam was reinstated in 1992, only four adult sea-run cutthroat trout were observed that year, two were observed in 1993, and none have been observed since (Hooten 1997). Nehlsen et al. (1991) considered the Hood River stock "at high risk of extinction". All populations of sea-run cutthroat trout above Bonneville Dam have experienced passage-related losses for nearly 60 years, and populations from the Wind and Klickitat River have been reported as extirpated (Nehlsen et al. 1991).

Considering the rate and magnitude of decline of the sea-run portion of cutthroat trout populations, immediate action is necessary to identify any remaining populations within the Columbia River Basin so resource managers can develop goals to protect and restore these stocks. In recognition that coastal cutthroat trout have a high degree of variability and plasticity in life history expressions (anadromy-potamodromy, fluvial-resident, etc.), we will conduct surveys above and below barriers to upstream migrations. The proposed study will provide a necessary first step toward setting management and recovery goals for coastal cutthroat trout above Bonneville Dam.

b. Rationale and significance to Regional Programs

Information on the current status of coastal cutthroat trout populations in the lower Columbia River, especially above Bonneville Dam, is extremely limited. Oregon tributaries of the lower Columbia River were last systematically sampled for cutthroat trout in 1981 (Hess 1982), and limited data are available for Washington tributaries (Leider 1997). The NPPC and the states of Washington and Oregon have recognized the need to address declines in sea-run cutthroat trout and to develop management measures that will facilitate recovery of declining stocks. Fishery managers have recently adopted size and area regulations to reduce harvest of sea-run cutthroat trout in the Columbia River and tributaries. Additional protective measures may be needed to avoid further declines.

The NPPC's Fish and Wildlife Program Sections 7.5E.1-E.5 acknowledge the need to identify and set management and recovery goals for naturally reproducing populations of sea-run cutthroat trout in the Columbia River. The work we have proposed will evaluate the status of sea-run cutthroat trout populations

above Bonneville Dam (7.5E.1), and examine the effects of limiting factors (7.5E.3), land use practices (7.5E.4), and hatchery production and harvest management practices (7.5E.5) on Columbia River sea-run cutthroat trout. The work is also consistent with NPPC goals to support native species in native habitats (Section 2.2A), and to improve management and conservation efforts by providing base-line information on status and life history of wild and naturally spawning populations (Section 7.1C).

c. Relationships to other projects

This project is a component of ODFW's *Hood River / Fifteen Mile Umbrella Proposal*. Objectives of the umbrella include: (1) determine abundance, distribution, and life history patterns of anadromous and resident fishes, (2) identify populations of steelhead and sea-run cutthroat trout and determine their status, and (3) restore and recover habitat lost as a consequence of human activities. Strategies to meet these objectives include surveying streams to determine presence-absence and relative abundance of cutthroat trout, conducting intensive surveys at index sites to estimate density and biomass of cutthroat trout, and reviewing existing biological data, subbasin plans, land management regulations, and current hatchery production and harvest management practices. These strategies are specifically addressed by the objectives of this project.

The proposed project will be a collaborative effort between the states of Oregon and Washington, as well as the U.S.G.S. Biological Resourses Division. Wherever possible, we will coordinate with existing projects and facilities to supplement our sampling efforts, increase project and program efficiency, and avoid duplication of effort. We will coordinate with projects that are proposed or in progress on the lower Columbia River, such as monitoring efforts associated with the Lower Columbia River Steelhead Conservation Initiative. Ongoing BPA-funded projects include project 9033, *Document Native Trout Populations*, and project 9095, *Bull Trout Population Assessment in the Columbia River Gorge, WA*. We will also coordinate with hatcheries to collect available information on cutthroat trout, including numbers, measures of length and weight, migrational timing, and scale and tissue samples.

d. Project history (for ongoing projects)

N/A

e. Proposal objectives

(1) Document existing data on historical and current distribution and describe management practices that affect coastal cutthroat trout in the Columbia River basin above Bonneville Dam.

(2) Determine status of naturally reproducing populations of coastal cutthroat trout above Bonneville Dam.

These two objectives are designed to meet the project goal of providing vital information on the current status of cutthroat trout populations in the lower Columbia Basin as a necessary pre-requisite to future recovery efforts. Products will include (1) a report on the effects of limiting factors, land use practices, hatchery production, and harvest practices on status and recovery of coastal cutthroat trout, and (2) a report on the current status of Columbia River cutthroat trout above Bonneville Dam.

Although this is a research project, work will focus on synthesizing existing information and determining current status of cutthroat trout populations. An overall hypothesis we will test is *Ho: The hydrosystem has no effect on the status of cutthroat trout above Bonneville Dam.*. Status will be defined as abundance of cutthroat trout as a proportion of historic abundance or as a proportion of abundance historic habitat would likely support. In future years, comparisons among streams will include a few selected streams below Bonneville Dam, to better estimate effects of the hydrosystem.

f. Methods

Objective 1 *(Document existing data on historical and current distribution and describe management practices that affect coastal cutthroat trout in the Columbia River basin above Bonneville Dam)*

Task 1a-To document historical and current distribution of sea-run and non-anadromous coastal cutthroat trout in the Columbia Basin, we will use literature sources and query agencies for established databases. Hatchery stocking records will be gathered to help determine potential origin and purity of present stocks. In addition, we will develop standardized questionnaires and give them to local biologists and others with notable experience or knowledge. These questionnaires will be based on the format successfully used to document status and distribution of inland cutthroat trout (see Appendix A in Duff 1996). Information sought by use of these forms will be professional knowledge and judgement on status, genetic purity, presence of non-native species, history of fish-stocking efforts, location and age of barriers, and extent of land management activities that affect cutthroat trout production. We will also contact private individuals and groups (e.g., Washington Trout, Oregon Trout, Skamania Flyfishers) to document additional written and oral knowledge of historical and current distribution.

All information will be compiled in a single database. Detailed maps will be created to illustrate historical and current distributions. To the extent that the data will allow, we will conduct analyses to determine stability of status and relationships of status to habitat factors.

Objective 2 *(Determine status of naturally reproducing populations of coastal cutthroat trout above Bonneville Dam)*

Task 2a-We will conduct an extensive survey of streams in the Columbia River Basin above Bonneville Dam to determine presence and status of cutthroat trout. Because of the limited number of populations that historically occurred above Bonneville Dam, we expect to sample all streams accessible to sea-run cutthroat trout in this part of the basin. We will also conduct surveys above barriers in streams suspected to have potential for holding remnant populations of cutthroat trout. A variety of sampling techniques will be employed including but not limited to snorkeling, electrofishing, seining, minnow trapping, and angling. We will conduct sampling and qualitative observations at times when adult (July-February), juvenile (July-October), and smolt (February-May) life history forms are most likely present and most vulnerable to sampling. We will estimate relative abundance when feasible. We will obtain measures of length and weight and record observations on appearance, external diseases, and overall health. Scales and tissues will be taken from all or enough fish to serve as a statistical sample (see Task 2c for how we propose to use these samples).

Task 2b-We will intensively sample 6-10 streams to serve as index sites of abundance. Criteria for selection will include (1) streams known to have, or have had a population of cutthroat trout, and (2) streams accessible to sampling. In future years, index streams will include a few downstream from Bonneville Dam, with approximately 50% of all streams located on each of the Oregon and Washington sides of the Columbia River.

Where site characteristics are suitable, we will conduct snorkel surveys to assess density and biomass of cutthroat trout populations. We will follow the methodology of Hankin and Reeves (1988) to estimate the density of cutthroat trout in selected stream reaches. Electrofishing will be used to calibrate density estimates using the ratio method detailed by Dolloff et al. (1993).

If efficient snorkeling is precluded by small stream size, we will electrofish within a stream reach of at least 500 m to estimate the density of cutthroat trout. To estimate density, we will conduct an intensive habitat survey of each stream reach during summer low-flow conditions. Within two weeks of a habitat survey, a fish survey will be conducted within a systematic sample of habitat units stratified by type (e.g., pools, riffles, glides). Habitat units chosen for sampling will be blocked off with nets and sampled by backpack electrofisher for a minimum of two passes using the removal-depletion method (Zippin 1956, Bohlin 1982). Population estimates will be obtained for at least two age groups (e.g. young-of-year, age 1 or older). Risks of injuring individual fish exposed to electrofishing will be minimized by using state-of-the-art electrofishers, and by using the field guides of Connolly (1996) to ensure maximum conservancy in the

number of habitat units sampled and the number of passes conducted, while achieving a controlled level of precision in population estimates.

As in Task 2a, we will obtain measures of length and weight and record observations on appearance and health of all cutthroat trout sampled. We will take scale and tissue samples for laboratory analyses described under Task 2c. During the course of sampling, we will record qualitative and quantitative data on other fish species to provide information on the role of species interactions in limiting production of cutthroat trout.

Task 2c-This task involves laboratory analysis of scale, otolith, and tissue samples collected as part of Tasks 2a and 2b. Scales will be examined to determine age, growth, and life history patterns including evidence for anadromy in adults. Otoliths will be subjected to elemental analysis to establish evidence of anadromy for the individual and the maternal parent, and to validate evidence for anadromy generated by visual examination of scales. Eye, body muscle, heart, and liver samples will be subjected to allozyme electrophoresis to establish the genetic population structure of cutthroat trout populations above Bonneville Dam. Sample sizes will be approximately 50 fish per population. It is impossible to know exactly how many populations might be found in the course of this work but we anticipate sampling up to four different populations for the electrophoretic work. Final analysis will include integration of the electrophoretic data into the ongoing genetic characterization of other cutthroat trout populations throughout coastal Oregon and Washington.

Scale, otolith, and other tissue samples (including fin clips) will be carefully archived to preserve the option for future analyses. Emerging technologies may allow us to refine our analyses and answer new questions as they arise. For example, caudal fin clips could be used for application of new DNA technologies such as microsatellite DNA (msDNA) analysis (Olsen et al. 1996; Wenburg et al. 1996). In addition, it may become feasible to use microscope laser ablation mass spectrometry to conduct extremely sensitive elemental analyses for the presence of environmental toxicants and precise timing of life history events such as estuarine or ocean entry.

g. Facilities and equipment

Staff and facilities associated with the Oregon Department of Fish and Wildlife's Northwest Region Research Program (Clackamas, OR), Washington Department of Fish and Wildlife's Kalama Research station (Kelso, WA), and U.S.Geological Survey's Research Laboratory (Cook, WA) collectively provide a long history of fisheries research expertise in the Columbia Basin. In combination with the personnel that will be hired and the equipment that will be purchased with the requested funds, these offices offer veteran professionals and modern office equipment and facilities to ensure that the highest quality professional research can be conducted.

Laboratory analysis of scale, otolith, and other tissue samples will be conducted by expert staff of the Washington Department of Fish and Wildlife at the Fish Aging Unit, Otolith Analysis Laboratory at the University of Washington's Electron Microprobe Laboratory, and Genetic Stock Identification Laboratory.

Special or higher cost equipment to be purchased with the requested funds include two backpack electrofishers ($4,600 each) and two computers ($2,750 each).

h. Budget

Personnel costs for FY 2000 include a project leader (1/2 time) and a two-person field crew (full time) for both ODFW and USGS. The number of streams to be sampled in Oregon and Washington, and the amount of existing information to be documented and synthesized support these levels. An additional 2 months of ODFW Program Leader time are required to coordinate and integrate activities of cooperating agencies, hire and supervise project leaders, provide technical oversight, and provide all project review/coordination activities (NPPC, BPA, CBFWA, etc.). WDFW time includes 2 months of a fish biologist to assist with field sampling and begin preliminary processing of samples. Remaining costs are associated with purchase

of appropriate sampling gear (electrofishing units, etc.), purchase of field and office supplies, and travel to sampling locations.

Section 9. Key personnel

David Ward
Oregon Department of Fish and Wildlife
17330 S.E. Evelyn Street
Clackamas, OR 97015

Education

Humboldt State University (Arcata, CA)	M.S. Fisheries, 1985
Humboldt State University (Arcata, CA)	B.A. Zoology, 1978

Experience

1984-Present: Oregon Department of Fish and Wildlife, 17330 S.E. Evelyn St., Clackamas, OR. (1) Program Leader for Northwest Region Research Program (1998-Present): Coordinate activities of ongoing departmental and interagency projects, identify needs for and develop future projects, provide technical oversight to project leaders, and supervise project leaders and other program staff. (2) Project Leader: Evaluation of the Northern Pikeminnow Management Program (1991-98). (3) Project Leader: Portland Harbor Study (1988-91). (4) Project Biologist and Technician on various studies (1984-87).

Duties as Program Leader on Proposed Study: Coordinate and integrate activities of cooperating agencies, hire and supervise staff of project leaders and biologists. FTE: 2 months each year.

Expertise Coordinated and integrated activities of cooperating agencies, hired and supervised staff of project leaders, project biologists, and seasonal workers, designed field and laboratory sampling plans, analyzed wide variety of biological data, authored, edited, and reviewed scientific reports and peer-review articles. Developed and submitted proposals for numerous research projects to various funding sources.

Publications and Reports

Ward, D.L., and M.P. Zimmerman. In Press. Response of smallmouth bass to sustained removals of northern pikeminnow in the lower Columbia and Snake rivers. Transactions of the American Fisheries Society.

Friesen, T.A., and D.L. Ward. In Press. Management of northern pikeminnow and implications for juvenile salmonid survival in the lower Columbia and Snake rivers. North American Journal of Fisheries Management.

Zimmerman, M.P., and D.L. Ward. In Press. Index of predation on juvenile salmonids by northern pikeminnow in the lower Columbia river basin from 1994-96. Transactions of the American Fisheries Society.

Beamesderfer, R.C., D.L. Ward, and A.A. Nigro. 1996. Evaluation of the biological basis for a predator control program on northern squawfish in the Columbia and Snake rivers. Canadian Journal of Fisheries and Aquatic Sciences 53:2898-2908.

Mark Zimmerman

Oregon Department of Fish and Wildlife
17330 S.E. Evelyn Street
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Education:

Virginia Tech (Blacksburg, VA)	M.S. Fisheries Science, 1989
Virginia Commonwealth U. (Richmond, VA)	M.S. Biology, 1984
Moravian College (Bethlehem, PA)	B.S. Biology, 1979

Experience:

1990-Present Oregon Department of Fish and Wildlife, 17330 S.E. Evelyn St., Clackamas, OR. (1) Project Leader for Evaluation of Northern Pikeminnow Management Program (1 yr): Plan, coordinate, and implement field sampling and laboratory analyses, conduct data analyses, and prepare oral and written scientific reports. (2) Assistant Project Leader: Evaluation of Northern Pikeminnow Management Program (5 yr, 11 mo). (3) Research Biologist: Process to Analyze and Test Hypotheses. (3 months). (4) Project Leader: Smolt Monitoring at Little Goose Dam and lower Grande Ronde River (6 months);

Duties as Principal Investigator on Proposed Study: Review existing biological data and land management, production, and harvest management practices affecting cutthroat trout. Hire, train, and supervise seasonal field crew. Provide field expertise on surveys to determine status of sea-run cutthroat trout. Analyze and summarize data. Write summary reports. FTE: 6 months FY 2000, 6 months in FY 2001, and 6 months in 2002.

Expertise: Coordinated project activities with cooperating agencies, designed field and laboratory sampling plans, hired and supervised project biologists and seasonal personnel, analyzed wide variety of biological data, authored oral and written scientific reports and peer reviewed articles. Direct experience with methods and gears associated with habitat and fish surveys in streams, rivers, lakes, and reservoirs.

Publications and Reports:

Zimmerman, M.P. October 27, 1998. An overview of Columbia River predation studies. Workshop: Management Implications of Co-occurring Native and Introduced Fishes. National Marine Fisheries Service and Oregon Department of Fish and Wildlife, Portland, Oregon.

Zimmerman, M.P. In Press. Comparative food habits and piscivory of smallmouth bass, walleyes, and northern pikeminnow in the lower Columbia River basin. Transactions of the American Fisheries Society.

Zimmerman, M.P., and D.L. Ward. In Press. Index of predation on juvenile salmonids by northern pikeminnow in the lower Columbia River basin from 1994-96. Transactions of the American Fisheries Society.

Zimmerman, M.P., and R.M. Parker. 1995. Relative density and distribution of smallmouth bass, channel catfish, and walleye in the lower Columbia and Snake rivers. Northwest Science 69: 19-28.

Patrick J. Connolly

U.S. Geological Survey
5501A Cook-Underwood Road
Cook, WA 98605

Education:

Oregon State University (Corvallis)	Ph.D. Fisheries Science, 1996
University of Idaho (Moscow)	M.S. Zoology, 1983
Centre College of Kentucky (Danville)	B.S. Biology, 1977

Experience

1997-Present: U.S.G.S. Biological Resources Division, Cook, WA. Research Fishery Biologist. Current responsibilities: Team leader on research project to restore summer steelhead in the Wind River, WA. 1994-1997: Consultant to Wind River Restoration Team, WA; 1990-1996: Research Assistant, Oregon

State University, Corvallis; 1988-1991: Fish Biologist--Subbasin Planner, Oregon Dept. Fish & Wildlife, Corvallis; 1987-1988: Fish Biologist--Research, Oregon Dept. Fish & Wildlife, Clackamas, OR; 1985-1987:Fish Biologist, Beak Consultants Inc., Portland, OR; 1984-1985: Fishery Biologist, U.S. Fish and Wildlife Service, Cook, WA.

Duties as Principal Investigator on Proposed Study: Review existing biological data and land management, production, and harvest management practices affecting cutthroat trout. Hire, train, and supervise seasonal field crew. Provide field expertise on surveys to determine status of sea-run cutthroat trout. Analyze and summarize data. Write summary reports. FTE: 6 months FY 2000, 8 months in FY 2001, and 8 months in 2002.

Expertise: Areas of expertise include stream fish ecology and population dynamics. Experience on numerous studies involving anadromous and resident salmonids and non-salmonids of the Pacific Northwest.

Publications and Reports

Connolly, P.J. 1997. Influence of stream characteristics and age-class interactions on populations of coastal cutthroat trout. Pages 173-174 *in* J.D. Hall, P.A. Bisson, and R.E. Gresswell, editors. Sea-run cutthroat trout: biology, management, and future conservation. Oregon Chapter, American Fisheries Society, Corvallis.

Connolly, P.J. 1996. Resident cutthroat trout in the central Coast Range of Oregon: logging effects, habitat associations, and sampling protocols. Doctoral thesis, Oregon State University, Corvallis.

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Education:

Oregon State University (Corvallis)	M.S. Fisheries Science, 1992
University of Oregon (Eugene)	B.S. Biology, 1985

Experience

1995-Present: Fish Research Biologist II, Washington Department of Fish and Wildlife, Kalama Research Team. Kelso, WA. Current responsibilities: Design and conduct experiments to evaluate genetic interactions between hatchery and wild salmonids and examine temporal and spatial variation among steelhead populations. Create and maintain long term (20 yr) genetic and life history relational database. Prepare reports, professional presentations, journal articles. 1992-1995: Faculty Research Assistant, Oregon State University, Corvallis; 1988-1992: Graduate Research Assistant, Oregon State University, Corvallis; 1985-1988: Research Assistant, Oregon State University, Corvallis; 1983-1985: Undergraduate Research/Teaching Assistant, University of Oregon, Eugene.

Duties as Project Biologist on Proposed Study: Review existing biological data and land management, production, and harvest management practices affecting cutthroat trout. Manage laboratory of scale, otolith, and genetic samples collected directly by the proposed project and samples collected during monitoring and evaluation work directed at lower Columbia Basin steelhead and status. Review and edit project summary reports. FTE: 2 months in FY 2000, 3 months each in FY 2001 and 2002.

Expertise: Fish population genetics, genetic effects of hatchery fish on wild populations, stress physiology, behavior and physiology of wild salmonid juveniles, and life history variation in hatchery and wild steelhead.

Publications and Reports

Sharpe, C.S., D.A. Thompson, H.L. Blankenship, and C.B. Schreck. 1998. Effects of routine handling and tagging procedures on physiological stress responses in juvenile chinook salmon. Prog. Fish-Cult. 60:81-87.

Hulett, P.L., C. W. Wagemann, C.S. Sharpe, and S.L. Leider. 1995. Studies of hatchery and wild steelhead in the lower Columbia Basin. Annual Report to WDFW, RAD 95-03. 44 pp.

Sharpe, C.S., C.B. Schreck, and W.W. Dickhoff. 1994. Smoltification strategies in wild spring chinook salmon: implications for aquaculture. Proceedings of the International High Performance Fish Symposium. Vancouver, B.C. pp 68-70.

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Section 10. Information/technology transfer

All technical information obtained from this project will be maintained on a relational database. We will coordinate with parties interested in cutthroat trout in the lower Columbia Basin so that our database will be compatible with existing formats. We are particularly interested in compatibility with existing data compilation and management efforts associated with the Columbia River Basin Fish and Wildlife Program, namely the StreamNet Project. Distribution of project information will also include annual reports, a final research report, and a contributed paper at a scientific meeting.

Congratulations!